

VisualDecisionLinc: Real-Time Decision Support for Behavioral Health

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Summary: In 2000, the societal burden of psychiatric disorders was estimated at \$83 billion, \$26 billion of which was attributable to direct medical expenses. An Agency for Healthcare Research and Quality-supported [research review](#) of psychiatric disorders recommended that studies build evidence on the most appropriate initial treatment strategies for maintaining a favorable response. Improving the initial selection of treatments has the potential to reduce the time to remission, as well as reduce the likelihood of medication errors and the adverse events caused by medication switching. There is consensus among clinicians and health policy experts that mental health decision support tools that aid clinical decisionmaking hold enormous potential to improve psychiatric care, including initial treatment strategies. One strategy is providing clinicians with expert and evidence-derived knowledge at the point of care. General guidelines often lack treatment algorithms that are tailored to a patient's symptom profile and disease history. Thus, supplementing clinical guidelines with data on treatment response from patients sharing similar profiles would narrow the range of treatment options to those based on the best available evidence.

To address these needs, Dr. Mane and his research team are developing a software-based decision support prototype known as VisualDecisionLinc (VDL). The VDL is designed to provide decision support for treatments of major depressive disorder (MDD), one of the most prevalent and burdensome psychiatric disorders. The project is: 1) developing new approaches to selecting comparative patient populations based on expert, guideline, and data-driven approaches; 2) developing software user interfaces (UIs) to allow clinicians to determine quickly which treatment approaches have been effective for patients similar to the presenting patient; and 3) providing an initial evaluation of approaches in preparation of a larger- scale deployment and test of clinical effectiveness. In 2011, the research team built a database to maintain and clean patient data from the electronic medical record (EMR) so that it can be imported into the VDL. In collaboration with psychiatrists, the data were evaluated to identify a set of similarity attributes (SSAs) to define a comparative population. The SSAs include demographics such as race, gender, and age, comorbid conditions, and prescribed medications. The research has the potential to identify novel ways to leverage historical patient databases and demonstrate a health information technology (IT) approach to optimize treatment choices for behavioral health care.

Specific Aims:

- Develop and validate expert-driven, guideline-driven, and data-driven attribute sets for the creation of comparative populations. **(Ongoing)**
- Develop a data visualization-based user interface to aid in the selection of treatment choices.

(Ongoing)

- Conduct an exploratory effectiveness evaluation of VisualDecisionLinc in preparation for a larger scale, health IT implementation research. **(Upcoming)**

2012 Activities: In 2012, the focus was the development and evaluation of the VDL UI. The UI was integrated with the analytical engine developed earlier, which filters the database of patient information to identify a comparative population similar to the target patient. The UI was designed to give providers the capability to click to select SSAs of interest and get instant and updated views of the presented evidence. Aggregated evidence on prescribed medications was organized by medication class to facilitate the understanding of medication combinations prescribed to the comparative population. Additional data views were built to provide an at-a-glance view of comorbid conditions for the comparative population as well as an overview of the patient's medical profile, including medications, outcomes, and comorbidities. All data views were designed to work in coordination so that any change in one view triggers automatic changes in the other views. The UI also integrated a guideline view that shows patient data in relation to the Texas Medication Algorithm Project, which developed guidelines for the treatment of the MDD patients.

The other major focus was to develop a data-driven approach to build a model to predict the next clinical global impression (CGI) score for clinical improvement and clinical severity. The CGI scale considers symptom severity, treatment response, and efficacy of treatments for patients with mental disorders. Analysis of the EMR data identified five predictors of the next CGI score: 1) CGI measured at the previous visit; 2) type of medicine prescribed; 3) psychiatric comorbidities; 4) type of treatment; and 5) demographic characteristics. The model had a predictive power of approximately 76 percent for CGI improvement and approximately 89 percent for CGI severity. The team is exploring the factors that may be driving the differences, including demographic characteristics, adverse drug events, and MDD.

As last self-reported in the AHRQ Research Reporting Systems, project progress is mostly on track, and project spending is on target.

Preliminary Impact and Findings: To evaluate the UI, the research team prepared a demonstration video with an explanation on the use of the VDL UI. Based on agile usability principles, the team conducted evaluations with two or three participants per cycle for quick feedback, optimized the UI design, and then retested it in followup evaluation cycles. Overall, the feedback was encouraging. Participants reported that they liked the view of patient-level demographics and the information about the patient's predicted and actual response to treatment. However, participants reported that it was difficult to distinguish between the predicted and the actual outcome. The team is working on this issue and plans to write a manuscript about the usability studies.

Target Population: Chronic Care*, Mental Health/Depression

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

**This target population is one of AHRQ's priority populations.*